

A man wearing a blue t-shirt with a "CAPITOL WASHINGTON DC" logo, a tan baseball cap, and headphones is working on a wooden boat hull. He is using a green orbital sander on the wooden frame. The boat hull is supported by a wooden stand. The background shows a workshop with various tools and equipment.

Everything You Ever Wanted to Know About Building a Boat

by Jeff Spira

Spira International, Inc.

Everything You Ever Wanted to Know About Building a Boat

How to Select a Design, Drift Boats & Dorries, Power Boats & Sail Boats, Ply
on Frame Construction, Stitch & Glue Construction, FAQs and Much More!

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Selecting a Boat to Build

The Style of Boat for Your Needs

Before you ever start building a boat, you should first consider what type of boat you want and/or need. I say and/ or, because a lot of people think they want a certain type of boat, due to current styles or some fanciful dream, when they actually should be considering an entirely different design. Let's discuss some of the basics of boat hulls so that you'll be able to look at a hull and figure out how it will perform.

Displacement Hulls

All boats operating at low speeds are displacement hulls. This includes planing hulls going slow. What defines a displacement hull is that the boat displaces the weight of water equal to the boat's weight (including the weight of the people and cargo inside.) Sailboats, canoes, kayaks, most dories, rowboats, trawlers, and cargo ships are all examples of displacement hulls. For a displacement hull to move through the water it must push water aside as it passes, then after it passes water comes back together to refill fill the space taken up by the hull. The ease at which the boat passes through the water is dependent upon the shape of the hull at the waterline.

Look at it this way: Imagine a kitchen knife. If you push it through water sideways, there's lots of resistance to it moving, but if you push it through water edge first, it moves quite easily. Displacement hulls work the same way. If their waterline shape is long and skinny, like a knife, they move through the water with ease. However, if the shape is short and wide, they have lots of resistance to motion. The ideal shape for a displacement hull is a canoe or kayak shape: long, narrow, and pointed at both ends. Believe it or not the stern shape is just as important as the bow shape when it comes to minimizing the drag. If you take a look at displacement hulls, like racing sailboats or commercial fishing boats, you'll see that the waterline shape is nearly always double ended, even if the boat has a transom stern.

As a displacement hull moves through the water, it creates a wave both at the bow, where the water is being shoved aside, and at the stern where the water is rushing back together. These waves get larger as the boat moves faster. As a displacement hull approaches the speed where these two waves interact, the waves actually start to push each other apart. Since the bow wave cannot move forward, as it is being created by the bow of the boat, the stern wave actually separates from the stern and begins to move aft of the stern as the boat increases in speed. The speed where this stern wave separation takes place is called the "hull speed." If the boat goes faster than the hull speed and the stern wave separates from the stern, the hull "squats" or lowers in the stern and begins having to not only move forward, but also move upwards, climbing a continually receding hill of water. Trying to push a displacement hull faster than its hull speed becomes very



inefficient power wise. If, for example, a 10 hp. outboard pushes a certain boat to its hull speed of 6 knots, putting on a 20 horse motor (doubling the power) may only get it up to 7 knots.

Note how both the bow and the stern create waves as this displacement hull moves through the water.

Note how the waterline of this sailboat is canoe shaped in spite of the transom stern.



This view shows the bow and stern wave created by the motion of this kayak

Planing Hulls

If you want to go fast on the water, you need a planing hull. At low speeds a planing hull works like a displacement hull, pushing water aside in front of it and bringing it back together after it. When the hull hits a certain speed, though, it rises up and skims across the water's surface, in an action known as hydroplaning. The planing hull skims across the water's surface like a flat rock skipped across the surface of a pond. Planing hulls are characterized by very flat lines aft and broad transoms. Ski boats and many of the popular center console fishing boats are classic planing hulls. They may be either flat bottomed or v bottomed.



Planing hulls are usually very poor performers in the displacement mode. They take a lot of power to move along slowly and often don't track well (go straight.) If you intend to row, sail or low power your boat, trolling, for instance, a planing hull is not a wise choice. The feature that helps a boat plane, a broad transom, is what causes the most drag in a displacement mode, the water having to come together after the hull passes through it creating turbulence and holding the boat back from slipping quietly through the water.

Semi Displacement or Semi Planing Hulls

Many hulls, particularly those designed in the early days of power, when motors were unreliable, are called semi-displacement or semi-planing hulls. These are hulls that are a compromise between the two, since often those early motors would break down and force the boater to row or sail home. Some more modern hulls are designed this way as well, especially in boats like party fishing boats - usually fairly lightly loaded. Some Naval



vessels are also semi-planing, so that they can operate in either mode. They need to break out of the "hull speed" restriction to

go faster using moderate power, but cannot afford the huge amounts of fuel consumed by the powerful engines that would be needed to get them to plane.

V-Bottom or Flat Bottom

The controversy rages on about which is the better boat. I've had people look at me in disbelief when I suggest they can use a flat bottomed boat, such as a Grand Banks dory, for deep water ocean use. They've always been taught that flat bottomed boats flip over. I don't know where that idea came from, but on several occasions, I've heard, "You'd actually take a flat bottomed boat to Catalina?" (an island about 25 miles off the coast of Southern California.)

The secret of boat stability is more a function of the boat's center of gravity and loading than the shape of the hull. In truth, a flat bottom hull is more stable at rest than a v or round bottom hull, when it comes to shifting loads from side to side. That's why big ships like freighters and tankers are all flat bottomed. The flat bottom hull tips far less than the v bottom. This is called "initial stability," and it's why flat bottom hulls are often a better choice for fishermen and people who bring along shifting loads, like children or dogs, who can't seem to sit still.

The one thing left unsaid so far, though, is that once a flat bottom hull passes its stable range, it does tend to become unstable, for instance, when struck abeam by a breaking sea, more quickly than a v bottomed hull. In conditions like these, a round bottom or v bottom hull with a weighted keel has far more tendency to return to upright than a flat bottomed hull.

Flare

Flare is another thing to consider in a design. Flare refers to the outward flaring of the sides of the boat. Note in the two views of boats in the following diagram, the hull of the boat on the right gets wider the higher the sides rise above the waterline. You can see that it has more flare than the boat on the left.



Boat with lots of flare



Boat with little flare

What flare does is provide what is known as reserve buoyancy, which is a fancy term for stability in rough seas. That's why many dories have lots of flare, so rough, choppy

seas will bounce them around a lot but rarely swamp them. Boats with a lot of flare also tend to get more stable as you increase their load. If you've ever hear someone say you have to load down a dory to get it to "sit down on its lines" they're talking about a boat with a lot of flare that tends to become more and more stable as it displaces (sinks into the water) more.

Typically boats without much flare tend to be very stable when lightly loaded, but when heavily loaded and in rougher water, they tend to swamp more easily than boats with more flare.

Boat Types

There are only a few types of boats really suitable for the amateur builder. If you're an excellent craftsman, and don't mind spending thousands of hours building a boat, of course, there are innumerable different types of vessels you could build given the motivation. However, if you're the average guy who would like to build a boat with a minimum of difficulty and get it into the water without too much ado, you're limited to a few simple types. Here are some of them:

Drift Boats

Everybody loves the thought of a varnished mahogany McKenzie River Drift boat drifting down a salmon river, tossing hand tied flies with their fly rod and having huge steelhead engulf their offering. You've probably got a picture in your head something like this:



This photo was taken on the real McKenzie River by a builder of the Spira International, Mackinaw Western style drift boat.

Drift boats have developed a kind of cult following. If you fish rivers, especially if you fly-fish rivers, you just have to have a drift boat. The truth

is that in many rivers you simply don't need the kind of whitewater performance that a driftboat has to offer, and you would be much better served with a boat that rows better than a driftboat. That's a hard concept to get across to some people. It's like the guys who jack up 4 wheel drive pickups, and put on huge off-road tires and shocks. They have a great off road vehicle they use just to commute back and forth to work. Most owners never take

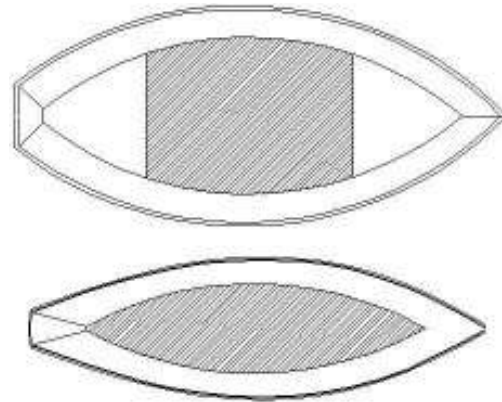
their monster trucks off road, and would be far better served by a two wheel drive vehicle with steel belted radials, but hey, the monster truck just looks so cool and so does the drift boat.

Drift boats are designed for one thing only - drifting downstream. They're not meant to move through the water by rowing, power or any other means. Let me say that again for those who don't believe me: They are NOT designed to move through the water by rowing, power or any other means. True drift boats are rowed only to keep the bow of the boat pointed downstream. They only move at the speed the water is moving. Here's a classic example of the kind of environment a drift boat is perfect for, this Dory blasting through the Grand Canyon:



That's what a real McKenzie River drift boat is all about: heading downstream in whitewater. If these are the kind of rivers you fish, well that's the boat for you. I call these "Western Style" drift boats. One caveat, though. If you were to put that driftboat in a calm lake and try to row it across, you'd be amazed at how difficult that would be. I've always said, I'd bet on the captain of my high school chess team - a glasses wearing, frail, 5' 6" wimp, rowing a Grand Banks Dory, against the captain of my high school football team, a 6' 4" bruiser who could bench press 350, rowing a Western style drift boat. Drift boats have almost no glide. Why? Because, they are NOT designed to move through the water by rowing, power or any other means.

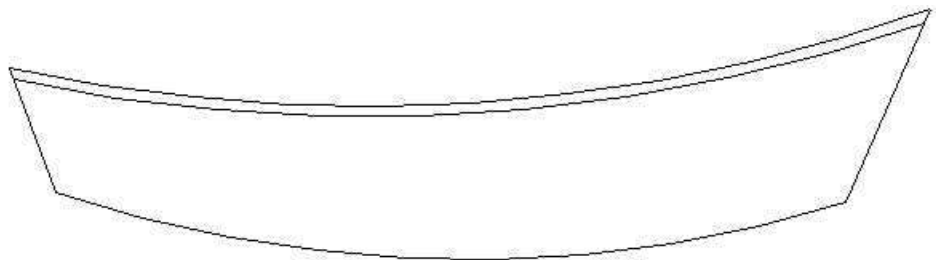
Here's what the waterline shape of my 17 foot Chinook looks like compared the waterline shape of my 16' Nova Scotian Grand Banks dory. Remember what I said about the most efficient shapes for displacement hulls.



Knowing what you know about displacement hulls and waterline shapes, which of these two boats do you think is more efficient? I know if I were planning a long trip down a big river, let's say the Mississippi from St Louis to New Orleans (being Tom Sawyer was one of my boyhood fantasies) I'll take a Grand Banks dory over a drift boat any old day. Think about this, have you ever wanted to turn around and go upstream? Even a little ways? Fagheddaboutit if you're rowing a drift boat.

I know what you're saying, "but they look soooooo cool." Ok so to satisfy the "gotta have a cool looking driftboat" crowd, I've developed a different type of driftboat, which I call a "Midwestern Style." With one, maybe my high school football team captain could eke out a victory over the chess team captain if the lake wasn't too wide. These are boats designed for the moderate running rivers common to most of the US, outside the Pacific Northwest. Take a look at these two drift boat profiles, both from my design catalog. The first is a 14' Riverman and the second, a 14' Canadian:

Riverman Western
Style



Canadian Midwestern
Style



Midwestern Style drift boats are for those of you who occasionally get into some whitewater, but mostly fish downstream in medium speed, wider rivers. If you compare the two styles, the first thing you'll notice is that there's not as much rocker, or curvature of the bottom, in the Canadian (the Mid-Western style) than there is in the Riverman (the Western Style.) If you reduce the rocker, the waterline shape gets longer, so that the boat will row better. It will glide a bit after you apply a power stroke to the oars - not as much,

mind you, as the skinny football shape of the Grand Banks style, but it's lots better for rowing than the pure Western style.

The amount of rocker has another effect besides making the hull more efficient to row. Boats with a lot of rocker pivot extremely well and easily with minimal oar inputs. This is critical when dodging boulders as you're catapulting down a gorge being propelled by angry whitewater, so Western types have plenty of rocker. Speed is of no consequence, since these boats aren't designed to move through the water by oar power.

Put one of these high rocker, Western style drift boats on a calm lake, though, and it becomes nearly impossible to row in a straight line. After all, you are most likely either right or left handed, so even the slight difference in the amount of pulling power of your arms can skid the boat sideways when rowing. If a boat has less rocker and a longer waterline shape, like a knife, it will prefer to go straight rather than turn. This is called tracking. A boat that doesn't track well is very difficult to row, while one that tracks well can be rowed rapidly, in a straight line. So even though the football team captain can put all kinds of energy into his oar strokes, much of it is wasted turning the boat this way and that, while the chess team captain travels in a straight line. Are you willing to bet with me yet? So our exclusive Mid-Western style drift boats offer the river fishermen a whitewater capable boat that also can be rowed in a straight line.



Note this
Midwestern drift boat
being rowed from the
oarsman facing aft:

Though they can
also be drifted with the
oarsman facing forward.

You also notice that
the Mid-Western style
drift boats have lower
sides. This is because of
fishing styles. While the
Oregon river fishermen



needs high sides for all of the splashing and sloshing going on, he also nearly never gets out of the boat when fishing, while the midwestern river fisherman often beaches his boat on the banks, hops out, and fishes the shoreline.



Both Western Style Drift boats and Midwestern style boat designs may be found at: <http://www.spirainternational.com/>.

Grand Banks Dorries

The Grand Banks Dory is an old design originally developed to fish the Grand Banks, off the coast of Nova Scotia. The big cod fishing schooners dropped off dozens of dories practically in the middle of the North Atlantic and the fishermen hand lined for bottom fish. The need for a lightweight boat able could cover many miles by oar and/or sail and survive the sudden gales that frequent that area was beautifully filled by the Grand Banks dories. These were originally built by two boatyards in Nova Scotia. Winslow Homer's famous painting "The Fog Warning" masterfully illustrates the life these hearty seafarers led.



Grand Banks dories had a lot of basic requirements. They had to be sturdy, for obvious reasons - Imagine being dropped off in the middle of the North Atlantic in an open row boat to spend the day fishing. Plus the beating they must have taken being stacked up on the deck of a sailing ship necessitated a strong boat. They also had to handle heavy loads of fish, and finally they needed to deal with rough seas safely.

These designs were so successful that they're still used today! Even in today's high-tech, innovative world, Grand Banks dories are considered the optimum rough water pulling boats, even competitors in surf boat races use this same, centuries old design. Lifeguards still use Grand Banks style dories for launching through the surf. Grand Banks dories are essentially displacement hulls, and so they work best at low speeds with low power, however, they will perform in the semi-planing mode, and will get up and scoot if decent power is added.



Grand Banks dories are also capable of being sailed. One of the benefits of a hull design like this is that it tracks so well. In many cases you don't even need a centerboard, particularly if you've added a small skeg to the bottom of the hull. The traditional Grand Banks dory sail rig is a spritsail rig, used in the Swampscott dories, the Beachcomber Alpha dories, but even earlier yet, on the original Grand Banks types. If you've ever seen the 1930's version of the movie "Captain's Courageous" you've seen Grand Banks style dories sailed with a sprit sail rig. It looks like this:

The traditional style Spira International Grand Banks Dory plans (the 16' Nova Scotian, the 19' Alaskan, and the 24' Labrador) all come with optional sprit sail rigs detailed right in the plans. You can make the spars and rudders yourself, from the details described in the plans. In addition the 19' Alaskan and 24' Labrador can be built with outboard motor wells for powering these boats with small outboards.



The smaller traditional Grand Banks dory offered by Spira International is the 15' Glousterman. It's an ultralight stitch and glue boat that can be built from only two sheets of 1/4" mahogany plywood. When I say ultralight, I mean less than 50 lbs. It was no problem for me to pick mine up by the gunwale with one hand and carry it to the water like a briefcase. The builder of the pictured boat commented: "It's the fastest boat I've ever rowed - and that's been quite a few." Keep in mind though, it's a pretty narrow boat and not particularly stable. It's fine if you keep the center of gravity low and centered but if you like to squirm around a bit, fish, or want to take another along who can't sit still, you're better off with another design.



Some Grand Banks Dorries in 11 to 34 feet you can build may be found at:
<http://www.spirainternational.com/>.

Carolina Dorries

The Carolina Dory is a specialized type of craft derived from the original Grand Banks styles after the advent of power. It was quickly learned that the built-in rocker on the bottoms of traditional dorries was fine for the very limited speeds attainable with oar or sail power, but only held the boats back once gasoline and diesel engines became available. As a result, builders straightened out the bottoms to allow the boat to plane, and the Carolina Dory was born. These sturdy craft were originally used as commercial fishing boats in the Mid-Atlantic States, especially in the inland and near shore waters around the Carolinas. Unlike modern power boats, Carolina Dorries don't require lots of power to move along at quite a good clip. They're economical and exhibit their traditional dory heritage by performing quite well and safely in choppy conditions.



The unique feature of Carolina Dories is that they will not only plane well, but also are moderately good displacement hulls. They're actually semi-planing hulls. The reason is because they were developed in the days when engines weren't nearly as reliable as today, and often the boater had to make his way home using his Armstrong motor -in other words, by rowing. If you tried to take a modern planing hull and row it, you'd quickly find out that a normal planing hull makes a lousy rowboat - not so with the Carolina styles. If you're looking for an economical, easy to build motor boat that can also be rowed in a pinch, you'd have to look far to find a better choice than a Carolina Dory.



Carolina dories are also one of the easiest framed boats to build. Their bottoms don't have any rocker, so setting up the framing is very simple.



Some Carolina Dories in 14 to 31 feet you can build to may be found at:
<http://www.spirainternational.com/>.

V-Bottom Dories

Quite a number of people have written me and asked for a v bottom version of my Dories. One customer has begun the construction of the bigger 24 footer, so I offer several of these boat plans for sale in 15' to 24' lengths. These v bottom Carolina dories will offer all of the advantages of the flat bottom version (low power, good speed, good sea keeping abilities, and ease of construction) with a more modern, v bottomed hull, to keep the pounding down and improve performance in a chop.

V-Bottom dories have found favor with boaters wanting a good boat for ocean fishing yet the hulls may also be used in the shallower waters of bays and inlets. It is an excellent compromise and to date many have been built and used.

These v bottom Carolina Dories are a bit more complex to build than their flat bottomed cousins, but are still well within the realm of an amateur boat builder. They're constructed of standard milled construction lumber, available at any lumber yard, and covered with exterior grade plywood. When you epoxy and fiberglass cover the outsides, they result in an extremely rugged boat, one that will serve for many years with modest maintenance.



Plans to build V-bottom Dories in 15 to 24 foot sizes may be found at:
<http://www.spirainternational.com/>.

Pacific Power Dories

For many years, the premier surf launch boat for the Pacific Northwest has been the Pacific Power Dory. These dories have proven themselves as rugged, and capable in some of the choppiest water anywhere. They're still used for commercial fishing and by sport fishermen and boaters wanting to get out in any weather.



Pacific power dories differ from other dories in that they have wide transoms with little rocker in the stern. This makes them better as power boats, getting up on a plane easier than other types of dories. They are able to mount bigger engines than their East

coast cousins, so they get up on a plane easily and reliably. Want a good, sturdy boat that'll handle heavy loads in any weather? Well, a Pacific Power Dory just might be the boat for you.

Pacific Power Dories have also been designed in offshore versions with higher sides, self bailing decks and built-in splash wells to minimize the effect of heavy following seas.



These may be built without cabins as well as with them. Plans to build Pacific Power Dories in 13 through 31 feet long may be found at: <http://www.spirainternational.com/>.

V-Bottom Center Console Boats

A growing trend these days is for new faster center console boats - and why not? They're great fishing machines with lots of open deck to create the ability to fight a bigger fish all around the boat without tripping on foredecks, windshields, or any other structures. In all, they're just about the ideal boat for what most people buy or build boats for fishing.

Note the deep forefoot on this V-Bottom, center console hull. With a deeper forefoot, the hull tracks straighter so the boat operates



better at slower speeds. I know I sure like to troll, and I'd sure rather do it in this hull than the Fountain hull above. This hull also features a semi v bottom, so it doesn't take three 250 horse engines drinking gas like a camel drinking water just home from a caravan across the Sahara. A 40-65 horse does just fine. And at today's gas prices....

Plans to build these v-bottom center console boats in sizes from 6 to 20 feet may be found at: <http://www.spirainternational.com/>.

Pangas

Pangas are a 1970s design by Yamaha in response to a world bank funding campaign to put inexpensive, easily powered boats in the hands of commercial fisherman in the third world. Yes, there were rather similar wooden boats built beforehand, but the Yamaha shape and style has since become the standard.

My version is an easy-to-build deep-v bottom, wooden model of that original Yamaha fiberglass version, that will handle offshore waters and get up on a good plane even when heavily loaded. They're great boats for bays, offshore waters, and even rougher lakes.



Panga Plans are available in 12' to 26' at: <http://www.spirainternational.com/>.

Mullet Skiffs

Mullet skiffs were originally developed for the Florida Mullet fishery back around the turn of the century (not this latest one, the one before that) to be able to carry a load while operating in shoal water. They were intended to be powered by the heavy, low

powered gas engines of the day. Like Carolina Dories, they had to be rowed or sailed home when the cantankerous motors of the day fizzled out.

Mullet Skiffs are based on a dory style hull, as were many boats of the time, for their rugged simplicity and ease of construction. The difference was, they added a v entry, and many had a rounded stern. This makes it stable, capable in rough seas, and easily driven with minimal power.

Here's a model of the typical Mullet skiff seen fishing the waters of the Florida coast many years ago.

During prohibition, when booze was outlawed, another feature of Mullet Skiffs was discovered. The design is really a semi planing hull, and when souped up with big straight 8 Cadillac motors, these boats could really move out, so enterprising fishermen made runs to the Bahamas and Cuba to load up on Rum and sneak it back to the states. When the G-men gave chase, they just firewalled the throttles and took off flying. Many a fortune was made in the 1920s "Rum Running" including the Kennedy family's (yes, John F., Bobby, and Ted's dad, Joseph Kennedy.)



This hull was essentially forgotten about for the last 50 years, or so until I stumbled across a book published in the 1940s extolling the virtues of these boats. At the time I was looking for a very seaworthy, semi displacement hull for super economical diesel power. I was leaning toward the Grand Banks dory style, but when I found the Mullet skiff, I suddenly realized, this is it, for a pocket cruiser capable of handling long passages on minimal power.



I've taken this old design and thoroughly modernized it to be built by the boatbuilding amateur, even a first time boatbuilder. I've made the construction simple so it may be planked with plywood sheeting and replaced the rounded stern with a simple transom. These sturdy cruising hulls are constructed of standard milled construction lumber, available at any lumber yard, covered with standard plywood, then fiberglassed over with epoxy resin to make a very tough, commercial grade hull ready for just about anything. Looking for an easy to build cruiser to explore the coast of Baja, take the inside passage to Alaska, or meander through the Caribbean? A mullet skiff will get you there with a minimum of cost. Imagine, doing a 1000 mile passage nonstop with only a couple hundred dollars' worth of diesel.

Plans to build Mullet Skiffs in 19' to 26' may be found at:
<http://www.spirainternational.com/>.

Ultralight Stitch-and-Glue Boats

There are a number of miscellaneous boats including small skiffs, prams, and bateaus that I offer. These are built by the stitch-and-glue method, that make for extremely light, very simple, and sturdy hulls. I include the Glousterman rowing dory in this category since it actually is such a boat, even though I also include it in the Grand Banks Dory category. Here' one of the designs of these unique boats:



Plans to build these ultralights are found at: <http://www.spirainternational.com/>.

Kayaks and Canoes

Sea kayaking is a new and rapidly growing sport. Ultralight stitch and glue kayaks are a easy and fast to build and are a lot of fun. Both covered deck styles and more open styles suitable for hunting, fishing and other sports other than simply paddling, are available.



Plans to build Kayaks and Canoes may be found at:
<http://www.spirainternational.com/>.

No matter which design you opt for, you can be assured that Spira International, Inc., offers some of the best designed plans available to the amateur builder. All efforts to make the boats as simple as possible are incorporated into these traditional boat designs.

Construction Techniques - Stitch and Glue, or Plywood on Frame.

One of the first decisions a potential new boatbuilder needs to ask himself is whether he should build the boat using stitch and glue construction or ply on frame construction. The answer depends on many factors, including the builder's woodworking

experience, which designs the builder prefers, available space, and just the emotional preference of the builder. I'll try to give you an overview of these methods so that you can make an informed decision based on facts and personal preferences, rather than blind advice from others.

In Morro Bay back in the early 1970s, I had a slip in a boatyard licensed to build the famous Radon Craft commercial fishing and diving boats. I watched many of these boats built and helped out on a few. It was my first exposure to boatbuilding. ACX plywood was roughly sawn into shape, then stapled together and covered inside and out with fiberglass using polyester resin. The incredible strength of these boats was graphically demonstrated when a particularly nasty southerly storm hit Port San Luis one spring. A 24 x 8 ft. Radon Craft broke loose from its mooring and was driven up on the breakwater where the heavy seas pounded it mercilessly on the rocks for over 4 hours. After the owner retrieved the boat, he was surprised to discover the only hull damage was a few dings and the loss of much of the bottom paint. Less than 4 hours work on the bottom was all that was needed to get it back in the water (after replacing the completely destroyed outdrive). Now THAT's one tough boat!

Of course, there can be no arguing with centuries old techniques of building sturdy lumber frames, tying these frames together with longitudinals and a keel (or keelson) and then planking the hull. When King Solomon sent his ships around Africa to his secret gold mines in the land of Ophir in 1000 BC, when Columbus sailed the ocean blue in 1492, when Old Ironsides chased the British out in 1777, when Josh Slocum single handedly sailed around the world in the Spray in 1898, and the majority of the amateur boats built in 2004, this time tested method is hard to argue with as a simple, strong, effective construction technique.

Let's examine these techniques: first, the stitch and glue method. Stitch and glue is only possible with the invention of plywood, fiberglass, and epoxy. Plywood panels are very strong, and when cut out and edge bonded together, produce light structures, with elegant lines. To begin with, patterns are drawn out on plywood and the panels are cut out. They end up looking something like this:

Holes are drilled in the edges of the panels and copper wire



threaded through the holes and twisted together forming a “stitch.” to hold the hull together. Some people use electrical wire tie wraps instead of copper wires. Other techniques use staples, tape or other methods to hold the edges of the panels together.

A fillet of epoxy is applied to the inside of the hull to bond the edges of the fiberglass together. This epoxy is thickened to the consistency of putty using microspheres, silica, or other thickening media, so that the fillet holds its shape. This fillet both glues the two panels together, and smooth’s out the transition so that loads are transferred without stress concentrations that can lead to cracks. These fillets are then covered with fiberglass tape for strength.



When cured, the boat is flipped over, the wires clipped and the same procedure performed on the outside of the hull, that is, filling with thickened epoxy, then covering the joint with fiberglass and epoxy. This results in a joint stronger than the parent

wood on either side. I've tested this premise, and found out that yes, the neighboring plywood will break long before the joint experiences failure when loaded.

A framed plywood boat, on the other hand is built using cross members called frames, tied together with longitudinal members. The construction is generally begun by building the frames. These are built on a simple jig to hold the parts together while they're being assembled.

Next the completed frames are set up on a strongback jig, a simple beam to hold the parts in alignment while the rest of the framing is attached.



The keelson, and other longitudinal members are then attached to the frames along with the transom and stem to produce the completed framing of the boat.

Once the framing is completed the hull is first covered with plywood. The framing is used as a pattern to cut out the ply panels, then the panels are bonded and screwed to the frames. This makes an integrated bonded wood unibody type structure very unlike similar wooden construction methods of the past.

Once covered with plywood, two layers of fiberglass are recommended. These are laminated in-place using epoxy resin. The epoxy is stronger and it bonds well to the plywood, unlike polyester resin used predominantly for all-fiberglass boats when bonding to wood is not an essential part of the process.



If you're a competent woodworker, you may feel more comfortable and have more fun building a framed plywood boat over a stitch and glue one. I know I really enjoy cutting and fitting wood. I like the smells, the feel of the plane as it digs into wood, the satisfaction of crafting the wood. You just don't seem to get the same satisfaction out of mixing epoxy and buttering joints while wearing rubber gloves. You should use a respirator when sanding either wood or epoxy, but it's more necessary with epoxy.

However, if you want to get a boat together in the least amount of time, and really enjoy high tech innovations, then the stitch and glue boat is probably best for you. I built the original Glousterman in two weekends working about a half day each, for a total of less than 16 hours. There are no framed boats that go together that even close to that fast.

No matter which construction method you opt for, you can be assured that Spira International, Inc., offers some of the best designed plans available to the amateur builder. All efforts to make the boats as simple as possible are incorporated into these traditional boat designs.

Frequently Asked Questions about Boatbuilding

Q. I have some experience with woodworking but have never built a boat. Can I REALLY build one by following your plans and instructions?

A. Of course you can. Many of my customers are first time builders and many have never even seen a boat built. My directions are thorough, but I don't get into minute detail. I assume when I say, "Cut notches in the frame to accomodate the shear clamp" you have enough woodworking experience to know this involves carefully measuring the shear clamp, laying out and marking the cut on the frame, then carefully, with a back saw making the cut, leaving a little extra wood that must then be trimmed out with a chisel and/or a rasp. If you can read drawings, you'll be fine.

Q. Many designers say lofting a boat is difficult so offer full sized patterns. Why don't you?

A. This has been one of the biggest myths perpetrated on the boat building world. At one time, with shapely round bottomed, wine glass sterned, wooden boats, lofting may have been an esoteric skill best left to professionals, but these days, with V and flat bottomed boats, all the frame elements are straight - so lofting has become so simplified it's almost ridiculous. Tell me, do you think you'll need a full sized pattern to build a coffee table? Well the rib for a dory is simpler than a coffee table and all three of the lumber pieces needed to build it are straight. These days, lofting has morphed into what carpenters call measuring and cutting - so I don't offer full sized plans. They're just not needed and printing and shipping them is expensive. That's why my plans are lower cost than many designers, too.

Q. Do I need special boatbuilding materials, and if so where do I get them?

A. I'll let you in on a little secret, all of these boats that I've built personally (most of the designs) were built from lumber, screws and epoxy I bought at my local Home Depot warehouse type hardware and lumber store. Construction grade lumber is fine for these boats, and most lumber yards carry clear fir, or other clear workable lumber. I use the

imported type mahogany plywood these stores carry, that is roughly the same price as AB exterior fir ply that's available everywhere. You're certainly welcome to upgrade materials and use marine grade ply and hardwood frames, but just remember, your costs and construction time will increase appreciably. Ever plane a bevel on a piece of rock maple or oak? Try it first and compare it to some fir or spruce ladder stock before you commit to using hardwood, just so you know what you're getting into.

Q. My area doesn't have the materials you call out. Can I substitute with local materials?

A. Of course you can. For instance, out west where I live, fir is the most common construction material so many of my plans call for fir lumber. If you live in the southeast, good quality fir is unobtainable and shipping it in for your small project would cost a fortune - however, local cypress and pine is available, inexpensive, and just as strong as fir, so go ahead - use cypress! Also, out here on the Pacific rim, inexpensive Lauan (Philippine mahogany) plywood is everywhere and cheap but in the Northeast, forget it (or should I say fahgeddaboutit) but there is Russian birch ply now being imported that makes a fine boatbuilding material. Just be sure the glues are classified as "exterior." That means that the glue doesn't dissolve in water. Don't fret though, nearly all glues these days are synthetic and waterproof. Not too many horses around to keep the old natural glue factories supplied.

Q. How long does it take to build a boat?

A. That all depends on you. I have a good friend building a 21 foot center console framed boat who is in his 11th year of construction working a minimum of 8 hours per week. He's almost ready to install the engine. (By the way, this is NOT one of my designs!) On the other hand, I built the first Glousterman in two weekends spending about 4 hours per day (16 hours total.) I'd guess it will take you somewhere in between these two. Seriously though, the Spira International boats are about as simplified as you can get, and most people familiar with working with tools can build them in 100 hours or so for the smaller boats and 200 hours or so for the larger designs. This means two weeks full time or two months of weekends for a smaller boat and a month full time or 4 months of weekends for a bigger boat. Of course, your individual time will vary. Everyone has a different amount of time they plan their next step, they double check their cuts, and they spend agonizing over the details. My friend building the center console boat is extremely careful with every detail and is a perfectionist in fitting parts. I, on the other hand like to get things moving, and don't sweat the aesthetics too much.

Q. How much does it cost to build a boat?

A. Well, prices for lumber vary greatly depending on where you are. If you'd like to see a bill of materials on any of the boats, just download the study plans from the Spira

International website, and you'll get access to a bill of materials on all of the boat designs. Just print it out, drop by your local lumberyard and check the prices. You may even substitute materials with lower cost local materials if needed. You'll be surprised at how inexpensive it is.

Q. Where do I get the other specialized bits and pieces to build the boat?

A. Check out my links page. I have several international suppliers of marine equipment linked there. Most of these businesses have on-line ordering or they'll send you a catalog for ordering by mail.

Q. What exactly comes with your plans?

A. My plans consist of from 4 to 9 sheets of blueprints in "C" size (18 x 24 inches) depending on the complexity of the specific boat model. The first sheet is a general layout and the second a drawing & description of the construction, a bill of materials and sometimes notes. The following pages give detailed drawings of every part needed to build the boat, and layouts showing where each part goes. They're dimensioned in US Measurements (inches) or Metric (millimeters) and computer CAD generated for readability.

Along with the plans, comes an assembly guide with a description of the construction process, a tool list, some notes about the materials and other construction information. Some builders who have built boats from other designers, generally agree that mine are the most clear of anyone's they've seen.

Q. Do you do custom designs?

A. You bet. Drop me an e-mail and let's discuss it.

Q. Why should I buy my plans from Spira International?

A. Good Question. Well there are many people out there offering plans. Most are excellent, while some are just so-so. Many were designed many years ago, before the advent of modern materials and methods, while many are current. One thing I'll guarantee to you is that the Spira International hull designs have been developed for the amateur builder. It doesn't take any specialized knowledge or experience. If you can handle tools and read drawings, you can build one of my boats. If you have questions when building, I'm just an e-mail away. I've been offering plans since 1995 and quite a few of my customers are on their second, and in some cases, even third boat. All agree that my plans are the clearest and easiest to understand of anyone's.

I'm a degreed mechanical engineer. If you've ever flown on a Boeing 737, 757, 767, 777, or a Douglas MD-80 or 90, if you've ever driven or ridden in a Chevy pickup or SUV, a Cadillac, Buick Park Avenue, Pontiac Bonneville, or Olds 88, among many other products, you've trusted your very life to the safe operations of a sub-system of my

design. I put the same attention and care into these boat designs as I have in my other designs.

If you're ready to build a boat, hopefully these reports have educated you in what types of designs are available, which building technique is right for you, and have answered a few questions. Now is time to take the next step.

Q. Where can I get more information or buy plans?

A. Just stop by my website at: <http://www.spirainternational.com/> where you'll see more boats like those below, pick out a design, and buy the plans. They can even be downloaded instantly from online!